

**STATUS OF THE CLAIMS**

1. (Previously Amended) An expression vector, comprising a nucleic acid encoding a polypeptide at least 80% identical to SEQ ID NO:4 operably linked to a heterologous promoter, wherein said nucleic acid encodes a protein having monooxygenase P450 activity.
2. (Original) The expression vector of Claim 1, wherein the monooxygenase P450 activity is  $\epsilon$ -ring hydroxylase activity.
3. (Original) The expression vector of Claim 2, wherein the monooxygenase P450 activity further comprises  $\beta$ -ring hydroxylase activity.
4. (Original) The expression vector of Claim 1, wherein the monooxygenase P450 activity is  $\beta$ -ring hydroxylase activity.
5. (Previously Amended) The expression vector of Claim 1, wherein said nucleic acid sequence further encodes a polypeptide comprising a cytochrome P450 molecular oxygen binding pocket conserved consensus amino acid motif identical to SEQ ID NO:12.
6. (Previously Amended) The expression vector of Claim 5, wherein said nucleic acid sequence further encodes a polypeptide comprising a conserved transmembrane domain sequence identical to SEQ ID NO:10.
7. (Previously Amended) The expression vector of Claim 1, wherein said nucleic acid sequence further encodes a polypeptide comprising a conserved consensus cysteine motif identical to SEQ ID NO:14.

8. (Previously Amended) The expression vector of Claim 7, wherein said nucleic acid sequence further encodes a polypeptide comprising a conserved N-terminal transit peptide for chloroplast-targeting identical to SEQ ID NO:11.
9. (Previously Canceled)
10. (Previously Amended) The expression vector of Claim 1, wherein said nucleic acid sequence is SEQ ID NO:05.
11. (Original) The expression vector of Claim 1, wherein said vector is a eukaryotic vector.
12. (Original) The expression vector of Claim 11, wherein said eukaryotic vector is a plant vector.
13. (Previously amended) The expression vector of Claim 12, wherein said plant vector is a T-DNA vector.
14. (Original) The expression vector of Claim 1, wherein said vector is a prokaryotic vector.
15. (Previously Amended) A nucleic acid sequence encoding a polypeptide at least 80% identical to SEQ ID NO:04 operably linked to an heterologous promoter, wherein said nucleic acid sequence encodes a protein having  $\epsilon$ -ring hydroxylase activity.
16. (Previously Amended) The nucleic acid sequence of Claim 15, wherein said promoter is a eukaryotic promoter.
17. (Previously Amended) The nucleic acid sequence of Claim 16, wherein said eukaryotic promoter is active in a plant.

18. – 20. (Previously Canceled)

21. (Previously Amended) A transgenic plant comprising a nucleic acid sequence encoding a polypeptide at least 80% identical to SEQ ID NO:04, wherein said nucleic acid sequence encodes a protein having monooxygenase P450 activity, and wherein said nucleic acid sequence is heterologous to the plant.

22. (Original) The transgenic plant of Claim 21, wherein said transgenic plant comprises one or more of the following: *Brassicaceae*, *Poaceae*, *Fabaceae*, *Asteraceae*, *Solanaceae*, and *Volvocaceae*.

23. (Original) The transgenic plant of Claim 22, wherein said transgenic plant is a marigold.

24. (Original) The transgenic plant of Claim 21, wherein said transgenic plant is a crop plant.

25. (Previously Amended) A transgenic plant cell comprising a nucleic acid sequence encoding a polypeptide at least 80% identical to SEQ ID NO:04, wherein said nucleic acid sequence encodes a protein having monooxygenase P450 activity, and wherein said nucleic acid sequence is heterologous to the plant cell.

26. (Previously Amended) A transgenic plant seed comprising a nucleic acid sequence encoding a polypeptide at least 80% identical to SEQ ID NO:04, wherein said nucleic acid sequence encodes a protein having monooxygenase P450 activity, and wherein said nucleic acid sequence is heterologous to the plant seed.

27. (Previously Amended) A transgenic plant comprising a nucleic acid encoding a polypeptide at least 80% identical to SEQ ID NO:04 operably linked to a promoter, wherein the nucleic acid sequence encodes a protein having  $\epsilon$ -ring hydroxylase activity.

28. (Previously Amended) A method for altering the phenotype of a plant, comprising:
- a) providing;
    - i) an expression vector comprising a nucleic acid sequence encoding a polypeptide at least 80% identical to SEQ ID NO:04, and
    - ii) plant tissue; and
  - b) introducing said vector into said plant tissue under conditions such that expression of said nucleic acid sequence alters the phenotype of a plant.
29. (Previously Amended) A method for altering carotenoid ratios, comprising:
- a) providing a vector construct comprising a nucleic acid encoding a polypeptide at least 80% identical to SEQ ID NO:04, wherein said nucleic acid sequence encodes a protein having  $\epsilon$ -ring hydroxylase activity; and
  - b) producing a plant comprising the vector, wherein said plant exhibits altered carotenoid ratios.
30. (Previously Amended) A method for altering the carotenoid production of a plant, comprising:
- a) providing;
    - i) an expression vector comprising a nucleic acid encoding a polypeptide at least 80% identical to SEQ ID NO:04, wherein the nucleic acid sequence encodes a protein having  $\epsilon$ -ring hydroxylase activity, and
    - ii) plant tissue; and
  - b) introducing said vector into said plant tissue under conditions such that the protein encoded by the nucleic acid sequence is expressed so that the plant tissue exhibits altered carotenoid ratios.
31. (Previously Amended) A method for producing lutein, comprising:
- a) providing a transgenic host cell comprising a heterologous nucleic acid sequence, wherein the heterologous nucleic acid sequence encodes a

polypeptide at least 80% identical to SEQ ID NO:04, under conditions sufficient for expression of the encoded protein; and

b) culturing said transgenic host cell under conditions such that lutein is produced.

32. (Previously Amended) A method for altering carotenoid production in a plant, comprising:

a) providing a transgenic plant comprising a heterologous nucleic acid sequence, wherein said heterologous nucleic acid sequence encodes a polypeptide at least 80% identical to SEQ ID NO:04; and

b) cultivating said transgenic plant under conditions sufficient for increasing non-hydroxylated carotenes in the plant tissue.